ORIGINAL

Before The
Federal Communications Commission
Washington, D.C. 20554

RECEIVED
AUG 2 1999
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
Amendment to Parts 73 and 90	)	
of the Commission's Rules	)	RM
to Authorize the Transmission	)	
of Emergency Signals on	)	
Channel 200	)	

DOCKET FILE COPY ORIGINAL

To: The Commission

PETITION FOR RULEMAKING

Federal Signal Corporation ("*Federal Signal*"), by its attorneys, hereby petitions the Federal Communications Commission ("*Commission*" or "*FCC*") pursuant to Section 1.401(a) of the Commission's rules, to amend Parts 73 and 90 of Title 47 of the Code of Federal Regulations to allocate Channel 200 (87.9 Mhz) nationwide for the exclusive use and operation of an Emergency Radio Data System ("*ERDS*") by existing and future public safety licensees (*e.g.* police, fire, EMS, etc.). ERDS is a highly-effective low-power system for disseminating timely localized emergency information to motorists so that they may take appropriate action to avoid traffic accidents, oncoming emergency vehicles and weather-related disasters.

ERDS is capable of transmitting voice and data emergency messages from both mobile and fixed locations on traditional broadcast channels. When activated, ERDS automatically tunes a car radio to ERDS' operating frequency -- Channel 200 (87.9 Mhz) -- even if the car radio is not in use or is being used to play a cassette or compact disc. ERDS is, therefore, the first and only automobile warning system that can reach all motorists within an affected region

No. of Copies rec'd 0+4
List ABCDE

and give those motorists the time and opportunity to avoid impending hazards. Implemented on a large scale, ERDS could save thousands of lives and billions of dollars in unnecessary health costs and property losses. In light of these features and the resulting public interest benefits, Federal Signal respectfully requests that the Commission allot Channel 200 nationwide for ERDS use by public safety licensees.

BACKGROUND AND PUBLIC INTEREST BENEFITS

Motor vehicle travel is the primary means of transportation in the United States, providing citizens with an unprecedented degree of mobility. Yet injuries from motor vehicle crashes are the leading cause of death for persons of every age from 6-27 years old.[1/] In 1994, the economic cost alone for motor vehicle crashes was more than 150 billion dollars, the equivalent of $580 for every person living in the United States, and 2.2% of the country's Gross Domestic Product.[2/] In 1996, 41,907 people were killed in crashes, 3,511,000 were injured, and there were 4,548,000 crashes involving property damage only.[3/]

One method of reducing the number and severity of accidents and improving safety is to provide motorists with more effective warnings as to road, traffic and dangerous weather conditions. Effective warnings are increasingly important for another reason; with new developments in automobile cabin noise reduction, louder car stereos and the ubiquity of portable

---

1/ National Highway Traffic Safety Administration, *Traffic Safety Facts, 1996* (based on 1993 data).

2/ National Highway Traffic Safety Administration, *The Economic Cost of Motor Vehicle Crashes*, 1994, p.1.

3/ National Highway Traffic Safety Administration, *Traffic Safety Facts, 1996.*

phones, fewer motorists are heeding posted warning signs and the aural alarms of emergency vehicles.

No current warning systems provide the degree of practical and public interest benefits found in ERDS. Existing warning systems are stationary, necessitating that motorists directly approach the transmitter in order to receive the warning. This immobility, combined with limited geographic range, diminishes the flexibility of public safety organizations to issue timely warnings of transient conditions. Although an ERDS signal may be broadcast from a stationary site (such as the entrance to a bridge or a railroad crossing), ERDS is unique because it can be used by public safety vehicles and personnel as they move within traffic. Equipped with a mobile ERDS transmitter, public safety officials now will be able to respond to and warn motorists of rapidly changing traffic and weather conditions in time for motorists to respond.

The ERDS system largely eliminates existing radio warning system flaws, and therefore will provide public safety organizations and motorists with a powerful life-saving tool. In order to receive a warning by radio using other systems, motorists must take an active role in receiving the warning by tuning their radio to the appropriate channel or turning off the radio to receive external aural signals. The most revolutionary feature of ERDS is that it automatically activates a motorist's radio, tunes it to the proper input channel and then retunes the radio following transmission of the emergency message. Thus, ERDS effectively reaches all motorists that the public safety official intends to reach. Moreover, because ERDS will be installed in a motorist's car radio during the manufacturing process, it will require no separate cash expenditure by members of the general public, thereby ensuring that motorists are capable of reaping the benefits of the ERDS, effectively for free.

The tremendous public interest benefits of ERDS already have been recognized by law enforcement officials and emergency teams nationwide. Attached to this Petition as Attachment A are representative examples of letters from public safety officials supporting implementation of ERDS. Federal Signal has received letters of support for ERDS from fifty-six police, fire or other public safety entities located in twenty-four states. The California Highway Patrol and California Department of Transportation are so convinced of the safety benefits that ERDS will afford officers during high speed chases, that they invited Federal Signal to test the ERDS in their units at the highway patrol test track and training area in Sacramento, California. As a result of these tests, the California Highway Patrol and California Department of Transportation now have such confidence in ERDS that they have urged the installation of ERDS in all vehicles registered in California in order to hasten its availability.

ERDS TECHNOLOGY

ERDS was created through a coordinated effort between AC Delco, Ford Motor Company and Federal Signal.[4/] Federal Signal, which was founded in 1901, is a leading manufacturer and world-wide supplier of safety signaling and fire rescue products, industrial tools and safety vehicles. Its safety equipment includes police and fire siren and light bars, warning and hazardous area lighting and communications equipment (such as warning lights, status indicators intercom systems horns, bells and sirens). Federal Signal currently holds an

[4/] In January 1993, the National Radio Systems Committee, sponsored by the Electronics Industry Association and the NAB, introduced the standard for transmitting data over a sub-carrier of the FM broadcasting band. This standard, known as the Radio Data System, is the foundation of ERDS.

experimental license for ERDS[5] and has completed extensive testing demonstrating ERDS works, with minimal, if any, new interference created to co-channel FM stations or to analog TV channel 6.

ERDS essentially consists of two components, the transmitter/antenna and the receiver. The ERDS transmitter is not unique and Federal Signal envisions ERDS using both omni-directional and, where appropriate, directional antennas attached to public safety vehicles in order to produce a signal receivable at a distance of up to one mile.[6] The critical component of ERDS is an advanced receiver. The Federal Signal/Delco ERDS receiver has been designed to transition to Digital Audio Broadcasting, thereby ensuring that it will be a viable public safety mechanism for many years. Additionally, ERDS has been designed so that a motorist may disengage the receiver capability. To further the development and use of ERDS, Federal Signal, which holds a patent on the technology, will freely license it to other equipment manufacturers toward the goal of an open system.

The ERDS transmission system works as follows. The prototype ERDS receiver would be factory-installed with a second front end tuner. The receiver continually scans 87.9 MHz in the FM band searching for a program identification code indicating that an ERDS transmitter is activated. When the receiver detects a transmission, the second front end tuner activates and decodes the two segments of the transmission. The first segment is the control information that "captures" the radio receiver. Thus, if the radio is turned off, the receiver processes a special

---

[5] See, WA2XNX, Brazos, Texas (File No. BPEX-961024MF). An application for renewal of license (FCC Form 311) for WA2XNX was filed on July 7, 1999.

[6] A more stable antenna could be used for stationary ERDS transmitters with reduced power fixed at certain known traffic hazards such as railroad crossings and bridges susceptible to rapid icing.

digitized command that turns it on and tunes it to the prescribed frequency of 87.9 Mhz. If the radio is being used to play a cassette or compact disc, the receiver overrides and pauses the "play" function and tunes the radio to the prescribed frequency. If the radio is in use, the ERDS system retunes the radio to 87.9 Mhz. Concurrently, the ERDS decodes the second segment of the transmission, the emergency message. The message is transmitted for both text and aural display, in a continuous loop, although the ERDS only plays the message through once at a predetermined volume, before returning the radio to its preexisting state. Additional information on ERDS is contained in the Federal Signal descriptive materials attached hereto as Attachment B.

As noted above, Federal Signal holds an FCC-issued experimental license for ERDS and has tested the system in both Texas and California, with additional tests planned in the future. The test results demonstrate that ERDS functions as designed, with no interference to adjacent channel FM stations. The initial testing revealed that ERDS could theoretically cause some interference to television receivers tuned to analog Channel 6 in a very small area in the immediate vicinity of an ERDS transmitter. Such interference would be no more than momentary in the usual case of a mobile ERDS transmitter on a passing emergency vehicle. Federal Signal's engineering consultants, Lohnes and Culver, conclude that for fixed receivers in homes or businesses, and with mobile ERDS transmitters, interference to Channel 6 reception would be physically rare if not impossible.[7] To the extent that the Commission has concerns regarding this minimal interference, Federal Signal recommends that use of ERDS be restricted in these areas until analog Channel 6 television spectrum is returned pursuant to the

[7] See, Exhibit E, Technical Report, page 8.

Commission's DTV transition plan. A full explanation of the results of the ERDS tests is provided in the attached Exhibit E, Technical Report of Lohnes and Culver.

REGULATORY SCHEME

1. Choice of Frequency

ERDS has been designed to operate on Channel 200 (87.9 Mhz), which has been virtually vacant nationwide since the Commission reallocated the channel to otherwise displaced Class D FM non-commercial stations in 1978.[8/] This channel is ideal for ERDS and Federal Signal recommends that it be allotted nationwide for exclusive use with ERDS. First, the channel is virtually vacant nationwide, minimizing the need to relocate or displace existing licensees or to reconfigure the spectrum to free up a uniform usable channel for ERDS.[9/] Second, because Channel 200 is adjacent to the existing FM radio spectrum, using Channel 200 enables the ERDS to function simply, without the need to employ cross-service frequencies and technology. Furthermore, because of the minimal power requirements, no new interference will be created to other existing FM licensees. Federal Signal believes that the minimal power output of ERDS transmitters and the extreme public health and safety benefits of the ERDS countenance strongly toward allotting the channel nationwide.[10/]

[8/] *See NCE Order*, 69 FCC2d at 247.

[9/] A search of the FCC's website revealed only two users of Channel 200; Federal Signal and St. Francis High School of Mt. View California (BMPED-980313MI). *See* http://www.fcc.gov/fcc-bin/fmq?fre=87.9.

[10/] Federal Signal recognizes that Channel 200 traditionally has been considered to be part of the spectrum allotted to VHF television, and that its use for traditional FM broadcasting potentially implicates certain treaties with Mexico and Canada. Federal Signal accordingly urges the Commission to coordinate any international issues relating to the nationwide use of Channel for ERDS during the notice and comment phase of this proceeding. See *North American Regional Broadcast Agreement*, TIAS 1726; *Agreement Between the United States of America and the United Mexican States concerning Frequency Modulation Broadcasting in the 88 to 108 Mhz Band*, TIAS 2697.

2. Licensing Procedures

Creating a new allocation for ERDS would provide innumerable public interest benefits without taxing the Commission's resources, as Federal Signal proposes a streamlined regulatory framework. All existing public safety licensees would be eligible to use ERDS,[11/] which, like Travelers Information Service would be considered a Part 90 service despite its use of traditional broadcast frequencies. However, unlike Travelers Information Services, no particular license would be required for ERDS transmitting equipment if used by an otherwise FCC-licensed public safety entity. The Commission recently adopted a similar licensing scheme in its *Part 90 Report and Order*.[12/] Receiving equipment also need not be licensed, as it will be installed in each motor vehicle by the manufacturer.

Power output for the ERDS transmitter would be limited to 1-watt effective radiated power. Only type-accepted equipment should be permissible and compliance with all of the Commission's technical rules would, of course, be a condition of use of the ERDS transmitter. Because only one channel will be used for ERDS at minimal power, there is no need to implement co-channel or other spacing restrictions.

CONCLUSION

ERDS is a revolutionary weapon in the fight for motor vehicle and overall public safety. With ERDS, traditional Commission public safety licensees will be able to issue timely warnings

---

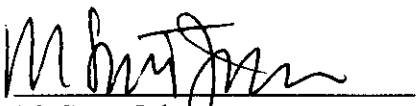
11/ *See* 47 C.F.R. §§ 90.15 and 90.20 (establishing eligibility criteria for public safety licensees).

12/ *Amendments to Part 90 of the Commission's Rules Concerning Private Land Mobile Radio Services*, Report and Order, 14 CR 1329 (1999).

of both text and aural emergency messages from mobile transmitters. Extensive testing has demonstrated that ERDS works, without causing appreciable interference to the protected contours of existing licensees. For these reasons, the Commission should amend Parts 73 and 90 of its rules and allocate Channel 200 for ERDS use nationwide.

Respectfully submitted,

FEDERAL SIGNAL CORPORATION

By: 

M. Scott Johnson
Francis E. Fletcher, Jr.

Gardner, Carton & Douglas
1301 K Street, N.W.
Suite 900, East Tower
Washington D.C. 20005
(202) 408-7221

Its Attorneys

Dated: August 2, 1999
DC01/240396.2

ATTACHMENT A

Supporting Letters From

Police, Fire and

Other Public Safety Organizations

Charles Brown
Chief of Police

DEPARTMENT OF POLICE

P.O. Box 450 Rt. 46
Budd Lake, N.J. 07828
(201) 691-0850
Fax (201) 691-8312

January 26, 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60466

Dear Mr. Williams,

The Mount Olive Township Police would like to support and endorse the implementation of the Emergency Radio Data System that we recently received literature on from your organization.

The system would greatly benefit the motoring public as well as increase our effectiveness in controlling traffic in situations where police intervention is needed. Our jurisdiction covers three major highways as well as five large apartment complexes that generate a large volume of vehicular traffic. When traffic accidents or storm related road closures mandate our attention we experience many problems with other motorists that would be greatly reduced with this system as well as increasing safety for our emergency service personel and police officers.

The small cost of the system could be offset through department of highway safety or drug forfeiture funds and would be a sound investment for both the public and automotive manufacturers. The system should be a mandated system required by either the federal or state government as it would not only benefit the citizens of Mount Olive Township but those of New Jersey and the United States.

Please advise me of any progress in the implementation of this system as we would be very interested in utilizing this valuable tool.

Sincerely,

Lt. Andrew Agens
Lieutenant

RECEIVED

FAIRVIEW TOWNSHIP POLICE DEPARTMENT

Emergency: 911
Office: (717) 901-5267
Fax: (717) 901-5234

"Dedicated to Service"

599 Lewisberry Road
New Cumberland, PA 17070
Email: fcop@epix.net

January 23, 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60466

Dear Mr. Williams:

On behalf of the Fairview Township Police Department I would like to express our interest and support for the Emergency Radio Data System (ERDS).

With society becoming so dependant upon mobility the resulting dramatic increase in vehicular traffic on our highways and byways all over the country, we, in law enforcement, are seeing the tremendous need for improved warning methods that overcome driver preoccupation by providing more specific advanced warning, information, and instruction to the motoring public. We must continue to strive to utilize whatever technology may be available in an effort to afford the highest level of protection to not only the general motoring public, but to our officers as well. One of the areas that most readily comes to mind where the ERDS could be very effective in providing much needed specific instructions would be during a pursuit situation where it is possible that a number of emergency vehicles may be involved and thereby increasing the potential risk to those motorists who would otherwise have no idea that a potential for getting in harms way exists. It would certainly be nice for the officers, or anyone operating an emergency vehicle, to know that there is a system actively in place that is automatically sending out a warning notification. These emergency situations are stressful enough while involved, that this would be one less significant issue the officers' would not have to deal with during an active incident.

As we understand the concept, it appears that implementation of this system would be financially reasonable for both the public and automotive manufacturers. We believe it could be recommended for use in Fairview Township. Furthermore, a state-wide mandate for system implementation would best serve the interests of the citizens of Pennsylvania.

Please keep me informed of your committee's progress in pursuit of this very important technology.

Sincerely,

Eric A. Bistline
Chief of Police

RECEIVED

Nacogdoches Fire Department
Training Division
P.O. Drawer 630648
Nacogdoches, TX 75963-0648
Ph (409) 564-0170; Fax (409) 564-6006; e-mail rsanders@ci.nacogdoches.tx.us

March 19, 1998

Federal Signal Corporation
Attention: Jerry Williams
2645 Federal Signal Drive
University Park, IL 60466

Mr. Williams:

I would like to inform you that I support the ERDS Initiative. I heard of the possibility of this type of warning system a number of years ago. At the time I heard of the warning system, I felt this was something that was worth while. I still believe this is something that is needed to improve the safe response of emergency vehicles.

Over the years, car manufacturers have made modifications to automobiles that allow the driver a quieter ride. By meeting the needs or requests of the driving public, safety has been compromised. Emergency equipment operators are having to drive more cautiously than ever due to the fact that many persons cannot hear audible warning devices due to interior vehicle noise and insulation preventing external road noise from entering the vehicle.

One of our fire engines was involved in an accident during an emergency response a number of years ago. The Engine Company came to a controlled intersection with the cross traffic having the green light. The Engine Company came to a stop until all cross traffic acknowledge their presence by stopping. An elderly female never heard the siren, drove around the stopped vehicles and hit our fire engine after they had decided it was safe to proceed.

Our community is a "university town" with a large number of students from across the country. Many of these students and local public school students have installed specialized sound systems in their vehicles. We daily have to contend with the problem of following these vehicles until they happen to see our warning lights and move over. With the sound systems in their vehicles, they cannot hear our audible warning devices.

I would like the see ERDS mandated by law to be in every vehicle.

Sincerely,

Russell Sanders

WEST END AMBULANCE SERVICE

Federal Signal Corporation
Attention: Jerry Williams
2645 Federal Signal Drive
University Park, IL 60466

Dear Sir,

I am very pleased to support the initiative for approval and usage of the ERDS system. Ever since I heard of this idea I have been excited about the potential it has to improve safety when responding in emergency situations.

With the noise reduction efforts of the auto manufactures it becomes increasingly difficult for the operator of newer cars to hear audible warning devices. It is not practical to increase the sound level of audible warning devices, as you well know this increases the risk of hearing loss to the emergency responders.

By expanding the use to construction sites, traveler information and other needs, it makes even more sense by helping ensure the safety of highway workers and possibly avoiding potential problems by notifying the public of upcoming hazards.

It is the goal of all involved in public safety to prevent accidents before they happen, and this systems will help in accomplishing this and also allow responding vehicles to reach emergencies safely and efficiently.

On behalf of West End Ambulance Service, I fully support the efforts of ERDS Initiative Committee. I hope that the FCC and the automotive Manufactures also realize that this will be beneficial to public Safety.

Sincerely,

Terry L Cramer EMT/P
Manager
West End Ambulance Service Inc.

175 Garfield St. / Johnstown, PA 15906 / (814) 539-8045

FREDERICK A. PERALTA, *Mayor*

Town Council
BOBBY F. DURAN
FRANK J. CRUZ
ERLINDA S. GONZALES
MELITON STRUCK

Gustavo Cordova, *Town Manager*

Neil W. Curran, *Chief of Police*

Town of Taos
Police Department

107 Civic Plaza Drive
Taos, New Mexico 87571

(505) 758 2216
Fax: (505) 758-5573

RECEIVED
3-12-98

March 6, 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60477

Dear Mr. Williams:

As the Chief of Police for the Town of Taos, New Mexico Police Department, I would like to take this opportunity of expressing my interest and support for the Emergency Radio Data System (ERDS). New Mexico generally is a state which is comprised of mountainous terrain, canyons, and roadways which parallel rivers, railroad tracks, winding through the mountainous terrain, making visibility difficult for motorists to identify unforeseen hazards on our roadways. Northern New Mexico consists of rural communities with minimal population, and unfortunately many times over, emergency support, equipment, and personnel response time is much greater than metropolitan areas. Emergencies that exist are those, such as serious automobile accidents on the roadway, rock slides, forest fires, flooding, and in some cases, an issue of livestock and wildlife along the roadway.

The ERDS appears to have the capability of effectively and efficiently providing motorists with prior notice of emergencies that may be encountered by emergency services personnel. It should be cost effective, most especially taking into consideration property damage and possible loss of life and/or injury as a result of the failure to adequately notify the motorists of a potential hazard.

As Chief of Police, I understand the concept of the system, and I feel the mandate of ERDS within all automobiles manufactured is reasonable, taking into consideration the cost and the end results. Emergency services personnel throughout the State of New Mexico, Taos County, and the Town of Taos are in support of ERDS. I feel it would be very wise to have the legislative body of the State of New Mexico require the system implementation as a result of the size of the state and the response time to emergencies upon our roadways.

I would greatly appreciate if your committee would keep me informed of the progress in pursuing this technology.

Sincerely,

Neil W. Curran
Chief of Police

NWC/ev

Helper City Police Department

73 South Main Street
Helper, Utah 84526
(801) 472-3719

JIM ROBINSON
Chief of Police

MIKE DALPIAZ
Mayor

Federal Communications Commission
Automobile Manufacturers

January 21, 1998

To Whom it may concern,

This letter serves to document my support for the ERDS (Emergency Radio Data System).

The use of this technology shall certainly save many hundreds of lives, both police and the general public. News reports across the United States indicate that several times each week incident scenes involving emergency vehicles are complicated by secondary accidents, many of which are fatalities, by other uninformed motorists approaching such a scene.

I do support the use of this important technology, and if anyone would like to contact me further regarding this technology, I am available at my office or I can be contacted at my home. Thank you.

Sincerely,

Jim Robinson

Chief Jim Robinson
Helper City Police

RECEIVED

CLAY COUNTY SHERIFF
120 S. Alabama Street
Brazil, Indiana 47834
(812) 446-2535
FAX: (812) 446-0941

Larry W. Pierce, *Sheriff*
Doug Smiley, *Chief Deputy*

January 20, 1998

RECEIVED

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60466

Dear Mr Williams:

The Clay County Sheriff's Department would like to express our interest and support for the Emergency Radio Data System (ERDS).

I have personally observed in 27 years of Law Enforcement of times if there would have been a way to notify the motoring public of certain events it could have saved lives and prevented serious injuries to both civilians and Police Officers. Just to be able to warn motorists on the busy Interstates to prepare for slowed or stopped traffic ahead would be a tremendous benefit to all emergency services.

In this day of 400-Watt amplifiers in teenager's cars and adults it is well known by Emergency crews that drivers will not hear sirens as they might have in the past. This program may cause a hardship on some departments to equip patrol cars, fire trucks, ambulances but I feel it would be money well spent. Insurance Company's should feel a impact after this is started due to less pay outs of claims due to someone not hearing a siren. In fact they might be able to assist local departments to secure needed equipment to install on the vehicles.

As we understand the concept, it appears that implementation of this system would financially reasonable for both the public and automotive manufactures. We believe it could be recommended for use in Clay County. Furthermore, a statewide mandate for system implementation would best serve the interests of citizens of the Indiana.

Please keep me informed of your committee's progress in pursuit of this very important technology

Sincerely,

Larry W, Pierce
Sheriff

POLICE DEPARTMENT
111 North 2nd Street • River Falls, Wisconsin 54022

Telephone 715/425-0909
Fax 715/425-0932

City of River Falls

Roger D. Leque, Chief of Police

January 23, 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60466

Dear Mr. Williams:

Please be advised I have reviewed the basic information provided me from Federal Signal Corporation in regards to the Emergency Radio Data System ERDS. I see this concept as having great potential for law enforcement use by providing the capability for providing specific information and instruction to the motoring public. This concept appears to have great applicability for a variety of emergencies encountered by law enforcement, including police pursuit and other traffic-related emergencies. I'm especially interested in the system's capability for interrupting FM radios or actually turning the radio on as necessary.

It is my opinion that this system deserves proper attention and I see it as very useful for officers in our jurisdiction.

Please keep me informed of you committee's progress in pursuit of this import technology.

Sincerely,

Roger D. Leque

Roger D. Leque
Chief of Police

RDL:ch

RECEIVED

cc: File

State of California—Business, Transportation and Housing Agency PETE WILSON, Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL
2555 First Avenue
Sacramento, CA 95818
916-657-7152
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

DEC 29 1995

December 22, 1995

File No.: 1.7308.A583

Mr. Jerry Williams, Director
Marketing & Sales
Federal Signal Corporation
2645 Federal Signal Drive
University Park, IL 60466

Dear Jerry:

The California Highway Patrol would like to express our interest and support for the Emergency Radio Data System that you recently demonstrated to us during the International Chiefs of Police conference in Florida. As you are well aware, there is a tremendous need for improved warning methods that provide more specific information and instruction to the motoring public. This need is based on an increasing concern for both the general public and our public safety officers. The ERDS appears to be capable of providing the much needed specific instructions for a variety of emergencies that we too often encounter.

The CHP would be interested in learning more about the system when you are ready. As we understand the concept, it appears that the implementation of this system would be financially reasonable for the public, and therefore it could be considered for a mandate in California. This mandate would serve the best interest of the people of California.

Please contact me when you are prepared to discuss this further.

Sincerely,

D. O. HELMICK
Commissioner

DEC 18 1995

Scott Wright
Project Engineer, Audio and Communications Systems
Delco Electronics Corporation
Mail Stop R314
1800 E. Lincoln Road
Kokomo, IN. 46904-9005

December 18, 1995

Mr. Roy Steward
Chief, Mass Media Bureau
Federal Communications Commission
Room 314
Mail Stop 1800-B3
1919 M Street NW
Washington D.C. 20554

Delco Electronics Corporation asks that you consider the allocation of a single, national, FM broadcast frequency for use in an Emergency Radio Data System (ERDS).

The ERDS would allow localized warning transmissions through the use of RDS data, and audio announcements. Localized warnings offer many advantages over the current Emergency Alert System (EAS). The single greatest advantage is that a warning would not be received by the public unless it was pertinent to the listeners geographical area. The current National Oceanic and Atmospheric Administration's (NOAA) 162 MHz warning system, and even the newly adopted Emergency Alert System do not offer enough geographic resolution to prevent warnings from being received by unaffected persons.

Additionally, public that is mobile such as in cars, buses, trains, or even on foot, have additional problems in sorting out warnings issued over high power networks. Without the use of costly location technologies such as GPS, there is no way to filter out irrelevant transmissions. ERDS solves the problem by localizing the broadcast area. This even brings the possibility of equipping emergency vehicles with ERDS transmitters.

We at Delco Electronics Corporation firmly believe that the Radio Broadcast Data System (RBDS) will come into great use in North America, and that ERDS would be a significant contribution towards providing additional public benefit. We urge you to adopt a national FM broadcast frequency in support of this.

Sincerely,

Scott Wright

CITY OF GOLDEN

POLICE DEPARTMENT

January 29, 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60466

Dear Mr. Williams:

The Golden Police Department would like to express our interest and support for the Emergency Radio Data System (ERDS).

There is a tremendous need for improved warning methods that overcome driver preoccupation by providing more specific information and instruction to the motoring public. This need is based on an increasing concern for the safety of our officers and the general public at large. The ERDS appears to be capable of effectively providing much needed specific instruction for a variety of emergencies that we encounter.

As we understand the concept, it appears that implementation of this system would be financially reasonable for both the public and automotive manufacturers. We believe it could be recommended for use in the City of Golden. Furthermore, a state-wide mandate for system implementation would best serve the interests of the citizens of Colorado.

Please keep me informed of your committee's progress in pursuit of this very important technology.

Sincerely,

RUSSELL L. COOK
Chief of Police

RLC/emn

911 TENTH STREET, GOLDEN, COLORADO 80401
(303) 384-8045 • fax (303) 384-8036

CAER
Community Awareness
Emergency Response

Suite 103
252 Chippewa St.
Sarnia, Ontario N7T 8A9
Phone: (519) 336-3656
Fax: (519) 383-1305

1998 03 23

ERDS Initiative Committee
Federal Signal Corporation
Attention Jerry Williams
2645 Federal Signal Drive,
University Park, Illinois,
60466 USA

Dear Mr. Williams:

This letter is to express xsupport for the concept of using 87.9 FM as an ERDS band width for the purpose of warning the general public.

I realize that this may be an American project, but we are a border community, adjacent to Port Huron, Michigan, and hope that there may be a way for us to use the frequency, once the project is realized.

Community Awareness Emergency Response is based in Sarnia, Ontario, Canada, serving an extensive petrochemical industry. Some of the members of our emergency response "half" - the Chemical Valley Emergency Coordinating Organization - are located in Michigan.

Sincerely,

Allen R. Wells
CAER Administrator

RECEIVED

Subj: Re: ERDS - FCC Rule-Making
Date: 98-02-18 13:25:20 EST
From: Stanly_Harter/OES@oes.ca.gov
To: SPECHID@aol.com

To Whom it May Concern: February 18, 1997

It appears that the ERDS concept being developed by Federal Signal is worthy of further research, development and beta testing in an urban environment having Channel 6 television service.

It appears that ERDS could substantially enhance public warning in two major areas: highway safety and the Emergency Alert System.

I welcome discussion and questions.

Stan Harter
(916) 262-1603 Email: seh@oes.ca.gov FAX 916-262-1677
EAS Consultant (1963-current)
Highway Safety Council, State of Hawaii (1974-1982)
Sworn Peace Officer (1960-1985)

---------- Headers ----------
Return-Path: <Stanly_Harter/OES@oes.ca.gov>
Received: from relay21.mail.aol.com (relay21.mail.aol.com [172.31.106.67]) by air17.mail.aol.com (v38.1) with SMTP; Wed, 18 Feb 1998 13:25:20 -0500
Received: from nic.teale.ca.gov (nic.teale.ca.gov [134.187.1.33])
by relay21.mail.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id NAA20634 for <SPECHID@aol.com>;
Wed, 18 Feb 1998 13:25:19 -0500 (EST)
From: Stanly_Harter/OES@oes.ca.gov
Received: from oes_smtp.oes.ca.gov ([205.225.145.65]) by nic.teale.ca.gov
(Netscape Messaging Server 3.01) with SMTP id AAA444
for <SPECHID@aol.com>; Wed, 18 Feb 1998 10:23:30 -0800
Received: by oes_smtp.oes.ca.gov(Lotus SMTP MTA v1.1 (385.6 5-6-1997)) id 882565AF.0066A55E ; Wed, 18 Feb 1998 10:41:10 -0800
X-Lotus-FromDomain: OES
To: SPECHID@aol.com
Message-ID: <882565AF.0063632A.00@oes_smtp.oes.ca.gov>
Date: Wed, 18 Feb 1998 10:33:49 -0800
Subject: Re: ERDS - FCC Rule-Making
Mime-Version: 1.0
Content-type: text/plain; charset=US-ASCII

TOWNSHIP Of DOVER

Toms River, New Jersey 08753

Office of the Chief of Police
Post Office Box 876
201-349-0150

30 January 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Avenue
Tinley Park, IL 60466

Dear Mr. Williams:

Dover Township Police Department would like to express our interest and support for the Emergency Radio Data System.

Dover Township, located in Toms River, New Jersey, has a population in excess of 85,000 people and is the county seat for Ocean County.

Traffic congestion and driver preoccupation is a daily concern for Dover Township emergency vehicles. Any device or piece of equipment which would address these concerns at a reasonable expense would be a great benefit to the citizens of Dover Township.

Please keep me informed of your committee's progress in pursuit of this very important technology.

Sincerely,

MICHAEL G. MASTRONARDY
Chief of Police

MGM:llk

RECEIVED

MONTGOMERY COUNTY
SHERIFF

Maryland's First
Nationally Accredited
Sheriff's Office

Raymond M. Kight
Sheriff
301-217-7000

50 Maryland Avenue
Rockville, Maryland 20850-2306

January 23, 1998

Mr. Jerry Williams, Director
ERDS Initiative Committee
Federal Signal Corporation
18606 South 81st Ave.
Tinley Park, IL. 60466

Dear Mr. Williams,

After reviewing materials concerning the Emergency Radio Data System (ERDS), I am convinced that ERDS will enhance the safety of our citizens and law enforcement personnel.

I urge the FCC to support this concept and allow ERDS to become a reality.

Please keep me informed of your progress.

Sincerely,

Raymond M. Kight,
Sheriff

RECEIVED

ATTACHMENT B

Federal Signal

Emergency Radio Data System

Descriptive Materials

ERDS

Local Area Emergency Radio Data System

"The Ultimate Warning Solution"

Federal Signal Corporation is a leader in the development and manufacture of warning equipment and systems. For years, we have dreamed of a warning system that could alert at any time, overcome loud audio entertainment systems, provide clear instructional information, meet the needs of the visually and hearing impaired, provide warning only to those who are affected, and provide warning for any type of situation. This dream also included the desire for the system to be essentially free to the consumer.

Our dreams have been realized in the form of RBDS (Radio Broadcast Data System)!

"Smart Radio"

In January 1993, the National Radio Systems Committee, sponsored by the Electronics Industry Association and the National Association of Broadcasters, introduced a standard for transmitting data over a sub-carrier of the commercial FM broadcast band. This technology, known as RBDS or RDS, has numerous benefits for consumers that will play an important role in placing this technology in their homes and automobiles. You will see it marketed as "smart radio."

RDS receiver displaying Police warning.

More than a side benefit to consumers, utilizing the smarts in "smart radios" as a means to warn the public can become the most significant function of the RDS. The foremost feature of the Radio Data System that makes it an excellent *emergency warning* system is its ability to control receivers by turning them on or pausing cassettes or CDs. This ability makes the system very reliable as a means of warning the general public.

Local, Meaningful Warning

The Emergency Radio Data System is unique in that it is based on warnings transmitted only over short distances (less than 5,000 feet) from a small, low power transmitter. The benefit of this is that the warnings are now always pertinent and non-disruptive as opposed to conventional commercial FM warnings issued over a much wider listening area. The old Emergency Broadcast System demonstrated how the public can quickly become apathetic to warnings if they are not consistently applicable.

Typical display of approaching Fire Truck.

Broadcasters also benefit from the ERDS because they do not have to interrupt their commercial broadcasts. ERDS warnings only interrupt receivers that are within the affected area.

Variety of Applications

Applications of the ERDS include transmitters in emergency vehicles, railroad locomotives, road construction sites, traveler information systems, and residential neighborhoods. Transmitters can also be installed in school buses to warn motorists when the door is open and children are loading and unloading.

Displays alerting motorists of children (top) and workers (bottom) in the area.

When activated, the ERDS momentarily takes control of the radio receiver by:

- ➤ turning it on if power is off or pausing a CD or cassette
- ➤ raising volume to a preset level
- ➤ displaying text identifying the hazard and direction of travel or mode
- ➤ broadcasting an audio message for specific instructions
- ➤ returning the listener to the original program, CD, or cassette

The general public usually does not understand the risks associated with most emergency situations. Furthermore, the public has not demonstrated a willingness to purchase products dedicated to public safety. The ERDS is sold "within" a commercial product at no additional cost, and the benefit of safety is essentially "free" to the consumer.

Typical display of an oncoming train.

RDS can also provide directional information.

Regardless of the emergency, the ERDS can provide text and clear voice instruction for the safest, fastest, and most accurate response.

For more information and a paper presenting the details on the ERDS, please contact:

Federal Signal Corporation
2645 Federal Signal Drive
University Park, IL 60466

Phone: (708) 534-3400

Fax: (708) 534-4727

Jerry Williams ext. 5503 or
E-mail: spechid@aol.com

Larry Block ext. 5160 or
E-mail: lblock8505@aol.com

FEDERAL SIGNAL CORPORATION
Emergency Products

©1995 Federal Signal Corporation, Printed in U.S.A.

LOCAL AREA

EMERGENCY RADIO DATA SYSTEM

THE UNIVERSAL WARNING SOLUTION

Federal Signal Corporation
July 1995

Table of Contents

Introduction

When an emergency situation occurs, getting the public's attention and providing vital information is critical for public safety. This applies to emergency vehicles, road or traffic hazards, school buses, railroad grade crossings, weather, earthquakes, and chemical hazard related emergencies. Conventional warning system effectiveness has been limited by technology, physical barriers, and a growing public apathy. Today's highly technical professional Public Safety director is demanding more in a warning system.

In order for a warning to be effective, three objectives must be fulfilled:

1) All individuals at risk should receive the warning.
2) The warning must be applicable to the individual.
3) The individual must know how to respond.

This paper describes a universally applied warning system based on a new consumer radio feature called Radio Data System (RDS) that meets these objectives as an effective system. RDS possesses features that when properly implemented, will create a cost effective warning system that serves all public safety related emergencies with a single system.

In order for this system to be implemented it is necessary to get your response so that we may communicate the demand for the Emergency Radio Data System (ERDS) to the consumer receiver manufacturers. Please complete and return the survey questionnaire included on the back of the postage paid card.

Thank you!

Please direct all inquiries to:

Jerry Williams
Director Sales & Marketing
Federal Signal Corporation
2645 Federal Signal Drive
University Park, IL 60466

Phone: (708) 534-3400
Fax: (708) 534-4727

Problem

Community emergencies, emergency vehicles, railroad grade crossings, and abnormal roadway conditions all present a serious hazard to the public and emergency personnel. Several factors suggest that the problems associated with alerting and notifying will increase in the future.

25% OF ALL FIREFIGHTER DEATHS ARE FROM TRAFFIC ACCIDENTS WHILE RESPONDING TO OR RETURNING FROM A CALL.

- Emergency vehicle response times are getting *longer* due to an increasing traffic density and more emergency call activity.
- Chemical and other man-made hazards are resulting in more community emergencies that lead to the evacuation of neighborhoods.
- Only one third of public railroad grade crossings have lights or gates. Railroads are looking toward high speed rail which is adding to the concerns of grade crossing safety.
- Highway construction sites kill hundreds of people every year.

With risk increasing, the task of warning becomes more difficult. Conventional warning equipment must attempt to overcome loud audio equipment such as radios, tape players, and CDs, better sound insulation, and more distractions (such as cellular phones). As the need for warning becomes more frequent, the public eventually becomes "immune" to conventional warning devices, and apathy grows.

IN 1991, 20 SCHOOL CHILDREN WERE KILLED BY A PASSING VEHICLE IN SCHOOL BUS LOADING AND UNLOADING ACCIDENTS.

Various products have been developed for alerting the general public of the presence of emergency situations, which sometimes require action to protect life and property. These products include broad area and local area applications. With local area products, the alerting is usually performed by a visual and/or audible signal, such as flashing or rotating ligths and sirens. Local area products are most commonly used with emergency vehicles. Such systems are intended to warn the public in the proximity of the emergency vehicle. Broad area products are exemplified by the United States Emergency Broadcast System, which uses broad area radio frequency (RF) transmitters to communicate emergency signals over a large geographic area.

In general, the alerting products broadcast light, audio, or RF signals. Light and audio signals attenuate relatively rapidly as they propagate relative to RF signals. This property makes light and/or audio warning products particularly appropriate for alerting over a range of only several hundred yards from the broadcast origination site, i.e., a local area. Also, light and audio signals are directly detectable by the human senses.

On the other hand, radio frequency signals are less attenuated by the atmosphere than light and audio signals. Therefore, RF signals are effective for providing warning over a broad range of several miles or more, i.e., a broadcast area, depending on the power of the signals at the broadcast site. Moreover, RF signals pass through most building materials without substantial attenuation, making them particularly suitable for carrying warning signals inside a home or other environments that isolate occupants from ambient conditions.

THERE WERE 1,127 TORNADO SIGHTINGS IN THE US DURING 1993. 3,239 INJURIES FROM WEATHER RELATED ACCIDENTS OCCURRED IN 1992.

Even though the range of RF signals is much more dynamic than light and audio signals, RF signals have the distinct disadvantage of requiring a recipient of the signals to possess a device for converting the radio frequency signals to signals that one or more of the recipient's five senses can detect. Typical broad area, RF-based warning systems in the past have used conventional AM/FM receivers as the device for converting the RF signal. In these systems, a commercial broadcaster agrees to use its transmitter as part of a community warning system. The transmitters used by these commercial broadcasters are typically immobile, high-power devices. In the United States, a national emergency network of this type is the Emergency Broadcast System, now called

the Emergency Alerting System (EAS). The network consists of commercial, broad area broadcasters intended to blanket the United states with an emergency RF signal that can be received by conventional receivers. These emergency broadcasts lack flexibility and are intended to provide blanket coverage over large geographic areas.

Traditional warning products that broadcast audible and/or visual warning signals are well suited for local area application. However, they have decreasing effectiveness when those intended to receive their signals are located in an insulated environment or an environment that is cluttered with other audible or visual "signals," such as urban areas. For example, flashing lights are only perceptible within a direct line of sight and cannot be seen around corners of buildings, which is particularly a problem in urban areas. Likewise, warning sirens cannot be heard by individuals with reduced or impaired hearing or in noisy vehicles, urban streets, or well-insulated dwellings.

Other factors that reduce the effectiveness of local warning systems include the use of an audio system in a vehicle, heavy traffic conditions, weather conditions forcing windows to be rolled up, the noise of forced air systems, and growing public apathy. Also, vehicles and dwellings have recently become better insulated, further masking audio or visual warning signals. These signal masking problems increase the likelihood that an audible or visual warning device will go unnoticed in a vehicle or building.

Various proposals to overcome these problems of traditional local area warning devices have been made. Several proposals have employed equipment dedicated to transmission of local area warning signals via RF transmission links. For example, known systems, such as radar detectors, have utilized dedicated transmitters located in an emergency vehicle and dedicated receivers in vehicles or locations to be warned. These systems require the installation and maintenance of RF receivers in addition to the conventional RF receivers of commercial band-widths typically found in the vehicle or home. **Consequently, these systems have failed to gain acceptance in the marketplace.**

THE NFPA REPORTS THAT IN 1992, THERE WERE 11,500 ACCIDENTS INVOLVING FIRE DEPARTMENT EMERGENCY VEHICLES RESULTING IN 1,050 FIREFIGHTER INJURIES — SEVEN DIED IN ROUTE TO EMERGENCY INCIDENTS.

Part of the absence of widespread use of such products relates to the perceived poor cost-to-benefit ratio for dedicated receivers that take up substantial space (especially in a vehicle) and are rarely used. Moreover, when they do activate, the user may view the conventional audible and visual warnings as effective alone, and therefore conclude that the dedicated receiver provides only an incremental and unnecessary improvement.

Another problem with known local area warning systems employing radio frequency links is the practical difficulties related to the installation of additional emergency radio equipment in a vehicle. Increasingly, mounting problems arise with the downsizing of vehicle passenger compartments coupled with limitations on mounting locations of such additional equipment due to interference with air bag deployment and the like.

Solution

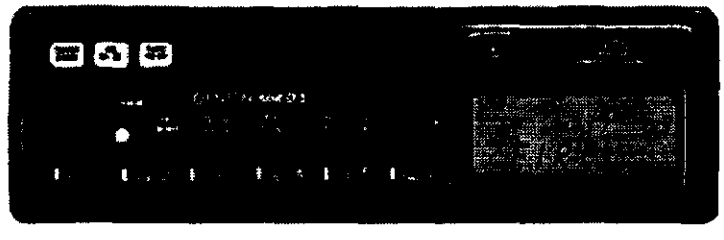
In January 1993, the National Radio Systems Committee, sponsored by the Electronics Industry Association (EIA) and the National Association of Broadcasters (NAB), introduced a standard for transmitting data over a sub-carrier of the commercial FM broadcast band. This technology is called Radio Broadcast Data System (RBDS). The basis for this standard was derived from the European Broadcasting Union's Radion Data System (RDS). For the purposes of this paper, the reference RDS will be used to describe either the European or U.S. standard. RDS has numerous benefits for the consumer that will play an important role in placing this technology in the homes and autos of consumers. These benefits are described later in this section.

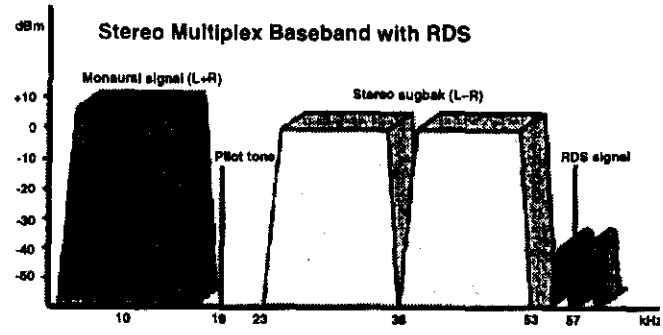
The features of RDS make this technology suitable to serve as a universal public warning system.

R·D·S
RADIO DATA SYSTEM

At this point it is very important to note that while the RDS protocol was initially created for commercial use by FM broadcasters, this universal solution does not require the involvement of commercial broadcasters.

In general, RDS provides for transmission of digital information encoded in a sideband of a carrier frequency for a normal FM (or AM) voice and music channel. Depending on the specific hardware and software of the receiver, the digital information is decoded and either displayed on a display of the receiver or interpreted as command signals for controlling the operation of the receiver. Control signals transmitted in the sideband may, for example, turn on the receiver and/or tune it to other frequencies. From its outward appearance, the receiver differs from conventional commercial RF receivers primarily in its larger alphanumeric display and RDS control buttons. In order to transmit information according to the RDS





Standard, the digital information appears on the third harmonic (a subcarrier) of the 19 KHz "pilot tone" for stereo broadcasts in the FM band between 87.5 through 108.0 MHz. (During monophonic broadcast the frequency of the encoded subcarrier is 57 KHz.) Digital information is encoded on this subcarrier as an amplitude modulated signal, and shaped by biphase coded data signals, using the differential coding scheme that follows a protocol outlined in the RDS Standard. The power of the data signal at and close to the subcarrier is minimized by coding each source data bit as a biphase signal. There is a dual binary signal shaping filter to shape the band limiting spectrum and timing and frequency spectrums of the biphase coded radio data signals.

Features of RDS that have commercial value to broadcasters include:

Program Identification (PI) – Enables the receiver to search automatically for an alternate frequency in case of bad reception of the program to which the receiver is tuned. The criteria for the changeover to the new frequency would be the presence of a better signal having the same program identification code.

Program Service Name (PS) – This is text consisting of not more than eight alphanumeric characters that is displayed by RDS receivers in order to inform the listener what program service is being broadcast by the station to which the receiver is tuned.

Program Type (PTY) – An identification number to be transmitted with each program, which is intended to specify the program type within 31 possibilities. This

could also be use for selective seeking stations by format (Jazz, Classical, Country, etc.). **PTY 31 is for alarm notification that is intended to switch on and/or raise the volume of the alerting audio signal of a receiver when it is operating in a waiting (off), playback, or standard reception mode.**

Traffic-Program Identification (TP) – This is an on/off switching signal to indicate, by means of a special lamp (or similar device) on the receiver, that this is a program on which announcements are usually made for motorists.

Alternative Frequencies (AF) – The list(s) of alternate frequencies gives information on the various transmitters broadcasting the same program in the same or adjacent reception areas, and enables receivers equipped with a memory to store the list(s), to reduce the time for switching to another transmitter.

Traffic-Announcement Identification (TA) – This is an on/off switching signal to indicate whether an announcement for motorists is on the air. The signal could be used in receivers to:

a) switch automatically from any audio mode to the traffic announcement;
b) switch on the traffic announcement automatically when the receiver is in a waiting reception mode and the audio signal is muted;
c) switch from a program carrying no traffic information to one carrying a traffic announcement.

After the end of the traffic announcement the initial operating mode will be restored.

Enhanced Other Networks Identification (EON) – This feature can be used to update the information stored in a receiver about program services other than the one received.

Clock-Time and Date (CT) – Allows the broadcaster to maintain the receiver's time and date.

Emergency Warning System (EWS) – The EWS feature is intended to provide for the coding of audio and digital warning messages.

Traffic Message Channel (TMC) – This feature is intended to be used for the coded transmission of traffic information.

THE LOCAL AREA
EMERGENCY RADIO DATA SYSTEM
UNIVERSAL WARNING SYSTEM

System Description

The Emergency Radio Data System (ERDS) Universal Warning System is comprised of low-powered (short range) transmitters broadcasting with RDS to RDS equipped consumer radio products. To support the ERDS, RDS equipped receivers will have a second front end (tuner) that scans the FM band searching for a program identification code indicating that an ERDS transmitter is broadcasting. There are two program identification codes (PI) for the ERDS. One is for automotive applications, and the other is for residential.

Depending on the application, the low-powered transmitter is mounted in an emergency vehicle, school bus, railroad locomotive, highway construction area, traffic sign, overpass, or utility pole, etc. In the case of remote controlled transmitters (i.e. traffic information, community warning) the transmitter is also equipped with a receiver capable of receiving the controlling agency's operating frequency.

When the "alert" flag is detected, the second front end of the ERDS equipped receiver activates. If the radio is turned off, a special command being transmitted from the transmitter will turn the radio on and preset the volume to a suitable level. During the most common warnings such as emergency vehicles, school buses, railroad grade crossings, and highway construction, the volume level of the commercial broadcast, CD, or cassette tape will be reduced but not turned off.

TEXT DISPLAY ON RADIO

WARNING SOURCE	DISPLAY
POLICE	POLICE
FIRE TRUCK	FIRE
AMBULANCE	EMS
SCHOOL BUS	CHILDREN
TRAIN	TRAIN
HIGHWAY CONST.	CONST
TRAFFIC HAZARD	TRAFFIC
WEATHER ALERT	STORM
CHEMICAL EVAC.	EVACUATE

Following the capturing sequence, the transmitter will send up to eight characters of text indicating the source, or type of emergency. This text will be displayed on the enlarged display that is standard on RDS equipped receivers. More importantly, attention-getting alert tones, or in extremely hazardous situations, an appropriate voice message will be broadcast, and the entertainment audio will be turned off or paused. These messages can be either from a recorded library, recorded just prior to broadcast, or live public address. When the warning sequence is completed, or if the signal fades the receiver is returned to its original status. In emergency vehicle applications, for example, the warning would only be heard once.

An effective radio based warning system should meet the following specifications:

1) The receiving equipment shall be commonly available to the general public.
2) The system shall allow one receiving device to function for all types of warnings.
3) Warnings shall only be received in the affected area.
4) The system shall alert regardless of the receiver's operational mode.
5) The system shall provide critical information to ensure proper response.
6) The warning shall be issued promptly.

The Emergency Radio Data System meets all of these specifications:

1) The receiving equipment shall be commonly available to the general public.

The general public does not understand the risk associated with most emergency situations. Further-more, the public has not shown a willingness to purchase products that are dedicated for public safety. The ERDS is sold "within" a product that has appeal to the consumer. Just as color televisions, video tape recorders/players, personal computers, cassette tapes, and compact disks have become common equipment in our cars and homes, RDS will soon appear as a standard feature on home and car radios.

At this time there are over 500,000 RDS equipped receivers in the United States. This represents only one manufacturer's distribution of both residential and automotive sales. This manufacturer is the first producer of RDS equipped radios for U.S. distribution at this time. Several other manufacturers have announced their plans to introduce RDS models in the near future. In many European countries, RDS is standard in all radio products.

As mentioned previously, past attempts to market products that are designed only for the purpose of warning have not been successful. The average consumer has not demonstrated that he/she places value in products that are dedicated to public safety. A logical assumption could also be that the consumer does not understand the risks that are associated with the variety of hazards that exists.

The Emergency Radio Data System can meet the requirement of being commonly available to general public by "piggy backing" on the commercial application of RDS in homes and automotive radio products. In other words, the public safety benefit is essentially free and transparent to the consumer.

2) *The system shall allow one receiving device to function for all types of warnings.*

The ERDS can be activated by several different ERDS transmitter applications. By utilizing voice messages, the same receiver is capable of receiving specific warning information from a variety of sources:

- Emergency vehicles transmitters
- Stationary and mobile construction/maintenance zone transmitters
- Stationary road side traffic information and advisory transmitters
- School bus transmitters
- Railroad grade crossings – locomotives
- Local fire, police, or emergency preparedness weather and man made hazard warning systems. (Emergency Alerting System & NOAA Weather Radio)

3) *Warning shall only be received in the affected area.*

As discussed in the "Problem" section of this paper, wide area warning like television and radio broadcasts, the new Emergency Alerting System and NOAA's weather radio service too often warn, or interrupt, a large percentage of the public that is not at risk, or the warning is not applicable. This results in public apathy toward the warning and reduces the system's effectiveness. To ensure that only receivers in the affected area are activated, ERDS transmitters are low powered with a range of up to 4000 feet. The actual range would vary depending on the type and source of warning. For example, an emergency vehicle traveling at 50 MPH would transmit a warning up to 3000 feet. If the vehicle is traveling 15 MPH, the signal range would be reduced to approximately 1000 feet. A community warning system's range would typically be a radius of approximately 4000 feet from the transmitter. A school bus would broadcast up to 1000 feet, etc.

Warnings issued by TV and radio broadcasters cover a broad area, regardless of the affected area, and are subject to becoming ineffective for the reasons mentioned previously. The ERDS will benefit the commercial broadcaster by reducing the need for their involvement, liability, and by allowing uninterrupted commercial broadcast in unaffected areas. With the new Emergency Alerting System, a broadcaster must discontinue all commercial broadcast to issue a warning over their entire broadcast area, even if the warning is not applicable to the entire area.

4) *The system shall alert regardless of the receiver's operational mode.*

One of the key features of the RBDS standard is the "EWS" function that provides the ability to turn the receiver on and "capture the receiver's attention" even if it is currenty turned off or playing a cassette tape or compact disk. **This feature virtually eliminates the common problem associated with loud radios, car insulation, and lack of driver's attention, by taking over the radio.** Without this feature the ERDS would not be practical and would not have been considered a viable method of warning.

This feature also enhances the ERDS effectiveness by providing a means to alert someone who is sleeping, or otherwise not using the radio. By adding a relay output, RDS equipped receivers can serve as **effective warning systems for the hearing impaired.**

5) *The system shall provide critical information to instruct proper response by the public.*

Due to the fact that the ERDS is a radio frequency based system, and the fact that it utilizes radio entertainment systems as the warning system receiver, it is possible to broadcast high quality voice messages to the listener. This provides a good method of communicating the critical instructions that are essential for a safe response by the affected public. This applies

equally to any of the prescribed ERDS applications.

This ability is key for making the ERDS a "universal warning system" as it is not dependent on the public's awareness or understanding of a variety of warning signals, or sound patterns that are emitted by warning sirens, etc.

6) The warning shall be issued promptly.

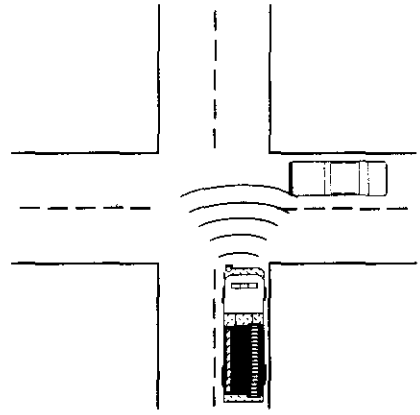
Early warning is key to obtaining a quick response in any emergency situation. Delays in reporting severe weather warnings using television broadcasts, for example, inhibit their effectiveness. In a February 22, 1993 column in *Broadcasting*, the author Neil Frank reported that it takes between 20 and 25 minutes from when a threat is evaluated by the National Weather Service to when it is run on television. To local emergency management officials, the task of warning the public is a foremost priority, and is not in competition with commercial interest or advertisements scheduling, etc.

Confusion in heavy traffic creates tremendous delays for emergency vehicles. These delays cost lives and property. ERDS provides for a means to communicate clear instructions, verbally, to everyone in the affected area in any emergency situation. This will result in safer passage and response for all.

ERDS APPLICATIONS

Emergency Vehicle Warning

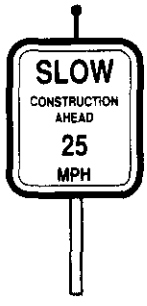
Emergency vehicles are faced with longer response times that are combined with a higher risk of accident when responding to a call. The ERDS provides for an additional warning to the conventional lights and siren warning system. A low powered transmitter is installed in the emergency vehicle and connected to the vehicle's emergency warning system's control. When the light and siren warning system is activated, the transmitter is powered and begins transmitting. The power to the transmitter is variable depending on the emergency vehicle's speed. The maximum range is approximately 4000 feet. The transmitter broadcasts the necessary RDS data to capture all receivers within range. The transmitter has the ability to broadcast a message selected from a library of stored messages in the transmitter, or the operator can record a custom message and replay it repeatedly. The latter would be useful to instruct approaching motorists of a detour if all lanes of traffic were blocked. The display would have text identifying the type of emergency vehicle to be looking for, alternating with the emergency vehicle's direction of travel. When the emergency vehicle's warning system is turned off, the transmitter is turned off, and all receivers would return to the mode they were in originally.



An additional feature on the emergency vehicle system is a special radio signal that broadcasts to other emergency vehicles. This is needed to assist in the prevention of accidents with other emergency vehicles.

Construction/Maintenance Zones

To warn motorists of temporary road construction or maintenance hazards, ERDS transmitters are mounted on structures such as signs, arrow boards, or in construction vehicles.



This transmitter would have a library of commonly used messages such as "right lane closed," "trucks entering," or "prepare to stop" that could be constantly replayed. Or, the unit could be activated by a flagman or sensor only when a hazard is present. Special messages can also be recorded. In addition, the range is variable depending on the particular hazard.

Traffic and Special Road Hazards

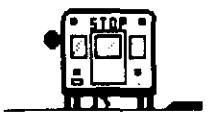
This system is similar to the Construction/Maintenance system, except that these transmitters are permanently mounted on signs, overpasses, or other structures or utilities.

These transmitters are typically remote controlled via a radio or telephone link from the regional Department of Transportation office or the State Police or Highway Patrol. Another way to control these transmitters is from sensors placed on the roadway that can detect and determine a hazard.

Uses include special traffic announcements that only affect the area of the transmitters, icy bridges, poor visibility, road closures from snow, ice, wind or high water, etc.

School Bus

Student fatalities that occur during the loading or unloading function of school buses are completely preventable. While some fatalities were the result of the bus driver striking the child, others were from vehicles passing a stopped school bus. ERDS will force the attention of approaching drivers and will serve as a reminder to stop.



This transmitter has a range of approximately 1000 feet and contains only one message. When the amber "pre-stop" or red flashing lights are activated, a verbal warning is broadcasted of the loading or unloading of children. The text "CHILDREN" is displayed on the car's RDS radio display.

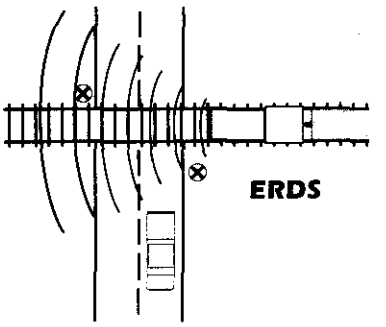
For school buses, it is recommended that the transmitter unit be equipped with an ERDS receiver/decoder. This would allow this unit to serve as a warning receiver to alert the school bus of approaching trains, emergency vehicles, or other special hazards on the roadway.

Railroad Grade Crossings

A serious problem exists at railroad grade crossings. There are several reasons why there are collisions between trains and automobiles. The highest percentage of accidents is a result of the driver of the automobile "running the gate." The primary solution for this problem will come from enforcement and public education. Other accidents are often a result of the automobile driver not paying proper attention at grade crossings that do not have lights or gates. In these cases it is not uncommon for the driver to be distracted by music or the cellular phone, or to be daydreaming. Some drivers simply did not see the train. The ERDS solution can force the driver's attention to the hazard.

Only one third of the country's public crossings has signal lights and/or gates. ERDS mounted on the moving locomotive would be most beneficial and the least costly solution for these crossings.

This transmitter would be either installed on the locomotive or at the grade crossing. Like the school bus unit, it would contain a single message that would be played constantly or would be activated by the Engineer when approaching a crossing. This system would operate at crossings where other warnings, such as the train's horn, are not required by law. The text "TRAIN" would be displayed on the automotive RDS radio receiver. This text would alternate with the train's direction of travel, such as "NORTH BD," "TRAIN," "NORTH BD."



Community Alerting & Notification

The ERDS community warning system would serve as a true "all hazards" alerting and notification system for the local emergency management agency. This system would be used to alert and inform the affected area only of all weather and other natural and man-made hazards. The transmitter would be similar to the remote radio controlled system described in the On-Road Hazard application, except that this system would broadcast on both the residential and automotive frequencies. The transmitter would be mounted in a zone configuration with a maximum range of 5000 feet. Each would have its own address to allow the warning to be issued to a selective area. If the community has a siren warning system, this transmitter would be mounted on the existing siren utility. The unit's receiver would be linked to the local emergency management agency's transmitter. Messages would be broadcast on the agency's frequency and would be repeated through the transmitter.

The local authorities would select which transmitters are needed for the warning, and only those units would be activated.

This system could be used to broadcast warnings and instructions to the affected areas that are issued by the Emergency Alerting System, and the National Weather Service's NOAA Weather Radio. Both residential and automotive receivers would be activated by this system within the ERDS transmitter range.

EXHIBIT E
TECHNICAL REPORT RE;
DESCRIPTION AND ANALYSIS OF THE
FEDERAL SIGNAL - ERDS SYSTEM

TABLE OF CONTENTS

FIGURES

Prepared by
Lohnes and Culver Washington, D.C.

July, 1999

EXHIBIT E
TECHNICAL REPORT RE;
DESCRIPTION AND ANALYSIS OF THE
FEDERAL SIGNAL - ERDS SYSTEM

INTRODUCTION

This statement is prepared on behalf of Federal Signal, a manufacturer and worldwide supplier of safety, signaling and communications equipment, fire rescue products, tools, parking control and other equipment. Federal Signal has developed an Emergency Radio Data System (ERDS) to be made available to emergency personnel to alert the public of imminent hazards. The statement contains a technical description and analysis of the system extracted from numerous reports and tests conducted on the system during its development.

PROPOSED SYSTEM OVERVIEW

The Federal Signal ERDS (Emergency Radio Data System) consists of a special ERDS transmitter and a suitable RDS (Radio Data System) receiver, like the Delco Smart Radio System, that has been configured to receive the ERDS signal. The system is designed to deliver a warning advisory to the public in a very discrete and localized area, near the emergency location. Unlike the broad area coverage of the regional or national EAS, the ERDS system is designed to act as a point of incident warning system. It will warn only the approaching or nearby members of the public of emergency situations such as road closures, traffic accidents, environmental hazards, emergency vehicles in transit, etc.

The system will use the basic existing RDS system to transmit a special warning signal in the FM band on a reserved channel. The system will alert the nearby public by using the RDS data capacity to capture and enable the receiver and then deliver a suitable warning and announcement. The announcement or warning would be delivered by an audio message on the FM channel. Either a "live" announcement or a recorded message

can be used. Other alternatives include distinct tones and digital voice synthesized messages stored in the FM receiver.

The system is proposed to operate on FM channel 200, 87.9 MHZ. This channel has been used in the recent past as a haven for former class D educational stations which could not achieve the FCC mandated minimum 100 watt ERP class A status. There is very little use of this channel today. Two stations, KSFH at Mountain View, CA and Federal Signal's own WA2XNX at Brazos, TX (an experimental station authorized for testing this system) are the only ones shown in the FCC FM technical database. The exclusive use of FM Channel 200 for ERDS would not impact the one existing class D FM station except in the event of an emergency very close to that station.

FM channel 200 is actually within the very upper end of the television channel 6 spectrum and as such Federal Signal has considered the potential impact on the very nearby reception of television channel 6. Likewise it is immediately adjacent to the bottom of the FM band and impact on nearby reception of FM stations on channel 201 has been considered. Possible interference to TV channel 6 and adjacent FM channels will be discussed in the following sections of this statement. Conversely the proposed ERDS system itself could suffer interference from these adjacent users over some area very close to the Television and FM transmitter sites. It was a fundamental task of the testing to define; first the useful service area, based on the power necessary to achieve service, and then the potential impact to other services based on that power.

SERVICE TO BE PROVIDED

The ERDS messages are intended to alert the public to an emergency condition within a specific and small area. The messages will be individually short but can as necessary be repeated relatively frequently, and thus run continuously during the emergency event. They may be transmitted either at a fixed emergency location or over an extended path by an emergency vehicle in transit. For example upon the occurrence

of a traffic accident and road blockage, an emergency vehicle at the scene may transmit a message of, "accident ahead, road closed, prepare to stop". Additional vehicles may be positioned at the perimeter of the emergency area or traffic blockage. Additional vehicles arriving or leaving the scene may also transmit a message while in transit, announcing, "emergency vehicle in transit, look for it and prepare to yield right of way".

DESIRED SERVICE RANGE

To be effective the messages must reliably reach the public within a range sufficient to give adequate warning time for vehicles in motion. For example, at 60 MPH (88 FPS) relative to a stationary incident, a one mile range would allow for approximately the following events; 10 seconds to trigger, capture and activate the receiver and begin the message, 10 seconds for a maximum length EMERGENCY message and a few seconds for the driver to react. This leaves about a 30 second time for the driver to avoid the situation ahead. If traffic is backed up from the actual incident, the time from receipt of the warning to the traffic stoppage will be shorter. However, the inherent warning from the stopped traffic ahead will offset some of that reduced reaction time. An emergency vehicle transmitting an additional warning at the point of stoppage may then also be used.

In the event of an approaching emergency vehicle the warning time may be cut in half, or less, by the increased rate of closure. But the potential for reduced reaction distance caused by stopped traffic is reduced. For overtaking emergency vehicles, the warning time is increased for the fixed message radius and a lower power and shorter range warning signal could be used. For the RDS system as envisioned, a 1 mile message radius appears appropriate. As discussed above, this minimum message radius is vital to deliver sufficient reaction time. Likewise, it is important to not make the radius too large which would deliver unnecessary warning messages to others nearby but not effected by the emergency.

REQUIRED ERDS SYSTEM ERP

In an effort to determine what transmitted power is necessary to reliably deliver the ERDS message at a 1 mile radius, Federal Signal conducted field tests with a prototype transmitter and test receivers. Details of this testing, and the following information, is based upon information from Allen Chisholm, of Lockard & White, an engineering firm located in Texas that assisted Federal Signal in its testing. The test report presents that the FM audio channel message was delivered and received as tabulated below. Note that the usable message was delivered at far below the nominal FM service contour value of 60 dBu and that even at the 0.25 mile range the low power ERDS signal did not reach the 60 dBu level.

DIST. MI.	FIELD INTENSITY	RECEPTION EXPERIENCE
0.25	56 dBu	"Good readability"
0.50	46 dBu	"Readable, some noise"
0.75	39 dBu	"Noisy, but readable"
1.0	32 dBu	"Very noisy"

These test results are listed for the more sensitive of the two available prototype test receivers. One receiver was about 10 dB less sensitive. The test transmitter operated at 1.0 Watt ERP from a 1/4 wavelength vertical monopole whip over a ground plane, the roof of the test transmitter vehicle. The effective signaling distance appears to fall slightly short of the 1 mile goal but in excess of one half mile. Despite the "very noisy" FM audio reception at one mile, there still may be sufficient signal to digitally trigger a warning tone or message built into the receiver. The effective distance is clearly affected by the receiver sensitivity and this must be taken into account in the final system design.

The nature of the alert message must also be investigated relative to effective distance. For example, stereo transmission would not be used since it degrades audio

performance under weak signal conditions. At the perimeter of the alert area, with weak and noisy audio, a transmitted alert tone would be detectable far before a voice announcement could be understood. Finally, an all digital tone or "canned" message, stored in the receiver, would activate the receiver and be clearly understood at longer distance, as the initial alert prior to or instead of the analog FM transmitted voice message.

INFORMATION CONTENT AND DELIVERY

The ERDS system is presently anticipated to deliver a voice message over the normal FM carrier on FM channel 200. Since channel 200 will be dedicated to this service the receivers will be designed to continuously monitor, or as an alternative to rapidly and repetitively monitor channel 200, for a signal above a specific threshold level. This threshold RF signal will trigger the system. Hence the receiver RF sensitivity and the transmitted signal level will control the message radius of the system.

The triggering signal will carry an RDS data message that will first identify the message as a true ERDS emergency message, not a spurious signal from nearby transmitters or intermodulation products. Up to this point the emergency message is not heard by the public. When verified as an ERDS message, the RDS data will instruct the receiver to retune to channel 200, or if it is turned off or using another input, to turn the receiver on and select the FM tuner, adjust the volume to a suitable level and enable the channel 200 audio for the message. The RDS data may well trigger other actions in the receiver. For example, in the future the receiver may have sufficient built in PROM (Programable Read Only Memory) and a synthesizer to generate an alert sound and/or a pre-recorded synthesized voice message.

INTERFERENCE FROM NEARBY TV CHANNEL 6 AND FM STATIONS

Operation on frequencies immediately adjacent to television channel 6 and FM channels is understood to present the potential for interference to ERDS in some locations.

Attached as Figure 1A is a graphical representation of interference from a channel 201 FM signal for various desired ERDS (channel 200) Receiver Input signal power. This information is based on laboratory testing of two ERDS receivers conducted at Federal Signal in mid June 1999. The two ERDS prototype receivers were supplied by Chrysler and Delco and are identified as such on the following figures.

Two significant test conditions were reported for each receiver. First was the Threshold of Audibility (TOA) for any detected interference in the desired (ERDS or FM) receiver audio channel. The second condition reported was the FM receiver "capture" point at which the desired message failed by either the interfering signal totally over powering the desired message or when the FM receiver audio or AFC was pulled to the interfering signal.

Figure 1A shows that a relatively flat interference response exists for all reasonable ERDS input signals. For the Chrysler prototype receiver the median TOA d/u ratio is -20 dB meaning the interfering adjacent channel FM signal can be as high as 20 dB above the ERDS signal before any audio disruption is noticed. The Delco receiver has a TOA d/u ratio of -32 dB, approximately 8 dB more resistant to interference. For both receivers there is an additional 22 dB of interference level increase until the ERDS signal is destroyed. In summary, the FM interfering signal must be at least 100 times stronger than the ERDS signal for any noticeable interference and at least 10,000 times stronger to disrupt the ERDS signal.

The interference mechanism from TV channel 6 will be very similar, since the ERDS signal is immediately adjacent to the TV audio sub carrier, an FM modulated signal just like FM channel 201. Therefore the anticipated effect on ERDS from nearby TV channel 6 stations would be similar. Federal Signal conducted field testing at the California Highway Patrol training facility in Sacramento California, in an area of strong channel 6 signal level, has confirmed that expectation.

INTERFERENCE TO TV CHANNEL 6 AND FM CHANNEL 201

The potential is acknowledged for interference to adjacent frequencies, specifically to television channel 6 and adjacent FM channel 201 operations in the area very close to an ERDS transmitter. Relevant laboratory tests have been conducted and FM interference is reported in Figure 1B and TV interference in Figure 2. Interference to FM transmissions was tested in the same test reported above for interference from FM to ERDS. TV channel 6 laboratory testing, both caused and received, was conducted in July 1996

FM INTERFERENCE

Figure 1B is the inverse of previously discussed Figure 1A, it depicts the interference caused to an FM transmission by the ERDS system using the same two test receivers. In this case the FM channel 201 program was subject to an interfering ERDS signal and again the TOA and "capture" points were observed. As before there is a very linear and nearly flat interference curve with the median TOA d/u ratios being -12 and -28 dB for the Chrysler and Delco receivers respectively. The median capture d/u ratios are approximately -31 and -57 dB for the Chrysler and Delco receivers respectively.

In summary, the ERDS signal must be from 20 to 400 times stronger than the FM signal for any detectable audio disruption and from 1000 to 500,000 times stronger for the FM signal to be destroyed. Given the very low 1 watt ERP of the ERDS signal, the resulting ERDS interfering distance is quite small. The mobile ERDS transmitter is unlikely to approach a fixed (household) FM receiver site sufficiently close to disrupt it and a mobile receiver, which may pass close to an ERDS transmitter, would normally be passed quite quickly unless both the FM receiver and the ERDS transmitter were both stopped at or close to the emergency location. In that later case the unintended capture of the FM receiver by the ERDS signal may actually be more beneficial than harmful.

TELEVISION INTERFERENCE

Interference to ERDS from the television audio carrier is addressed above in the interference from FM discussion. Interference from ERDS to television channel 6 is illustrated in Figure 2. Three different television receivers were tested at moderate video carrier input powers ranging from -14 dBm to +8 dBm. The television receiver video carrier to audio carrier power ratio for this tests was 14 dB (20% audio carrier voltage ratio). One receiver was tested at high input power at +36 dBm video and +24 dB audio, a 12 dB ratio limited by video generator output. As expected the video signal, much further removed from the ERDS frequency, was much less susceptible to interference than the television audio signal.

Figure 2 indicates that at these desired levels, moderately high ERDS signal levels, as might be found very close to the ERDS transmitter, are required for interference. The video d/u ratio was confined to the relatively narrow range of -17 to -22 dB. The interfering signal must be approximately 50 to nearly 200 times stronger than the television video signal to cause just perceptible interference. The audio interference d/u ratios were similarly flat, ranging from -10 to -7 for two of the receivers and from -8 to +4 for the high level test receiver. Again, generally at moderate television input signal levels, the ERDS signal must be stronger than the television audio signal to cause disruption. To achieve the necessarily high ERDS signal levels the ERDS transmitter must be very close to the television receiver. For fixed receivers in houses or businesses, and with mobile ERDS transmitters, this will be physically rare if not impossible. The only potential exception is if the building location of the television receiver is itself involved in the ERDS emergency. In that case, as above, the unintentional interference may actually be a desirable event.

A field check was made to confirm the potential interference into channel 6 television receivers. The field testing corroborates the laboratory testing and indicates interference only at small distances from active television channel 6 reception.

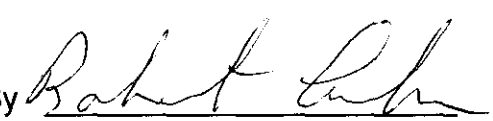
CONCLUSION; SUITABILITY AND EFFICACY OF THE ERDS SYSTEM

The proposed ERDS Emergency Radio Data System is designed to provide a quick response, small area, emergency announcement system. As such it requires only a limited service area, generally from a mobile vehicle. This small service area requires only a small ERDS radiated power. The system is proposed to operate on FM Channel 200, a channel set aside by the FCC for the few former Class D 10 watt ERP stations which were not able to achieve minimum class A FM ERP of 100 watts. At this time only one station is operating as Class D on Channel 200.

The limited power, intermittent and primarily mobile operation of the ERDS system will all act to prevent interference to other nearby operations. If interference actually occurs to FM or TV receivers at fixed locations, it is expected to last only a moment as that location is passed by the mobile ERDS transmitting vehicle. If interference actually occurs to mobile FM receivers, it too may be momentary. In any event, if an ERDS transmission were to cause continuous interference, that is a desirable event. In that case the receiver will be so close to the final ERDS transmitter that it may well be involved in the emergency or within the danger area, and as such interference will cause to warn and protect the listeners or viewers.

The use of ERDS confined to FM channel 200 at very low mobile power has no preclusionary impact on any other use of the FM band. The ERDS system establishes a potentially valuable rapid response warning system for public safety uses.

Respectfully Submitted,
Lohnes & Culver

By 
Robert D. Culver, P.E.
Md. Reg. No. 19672
July 29, 1999

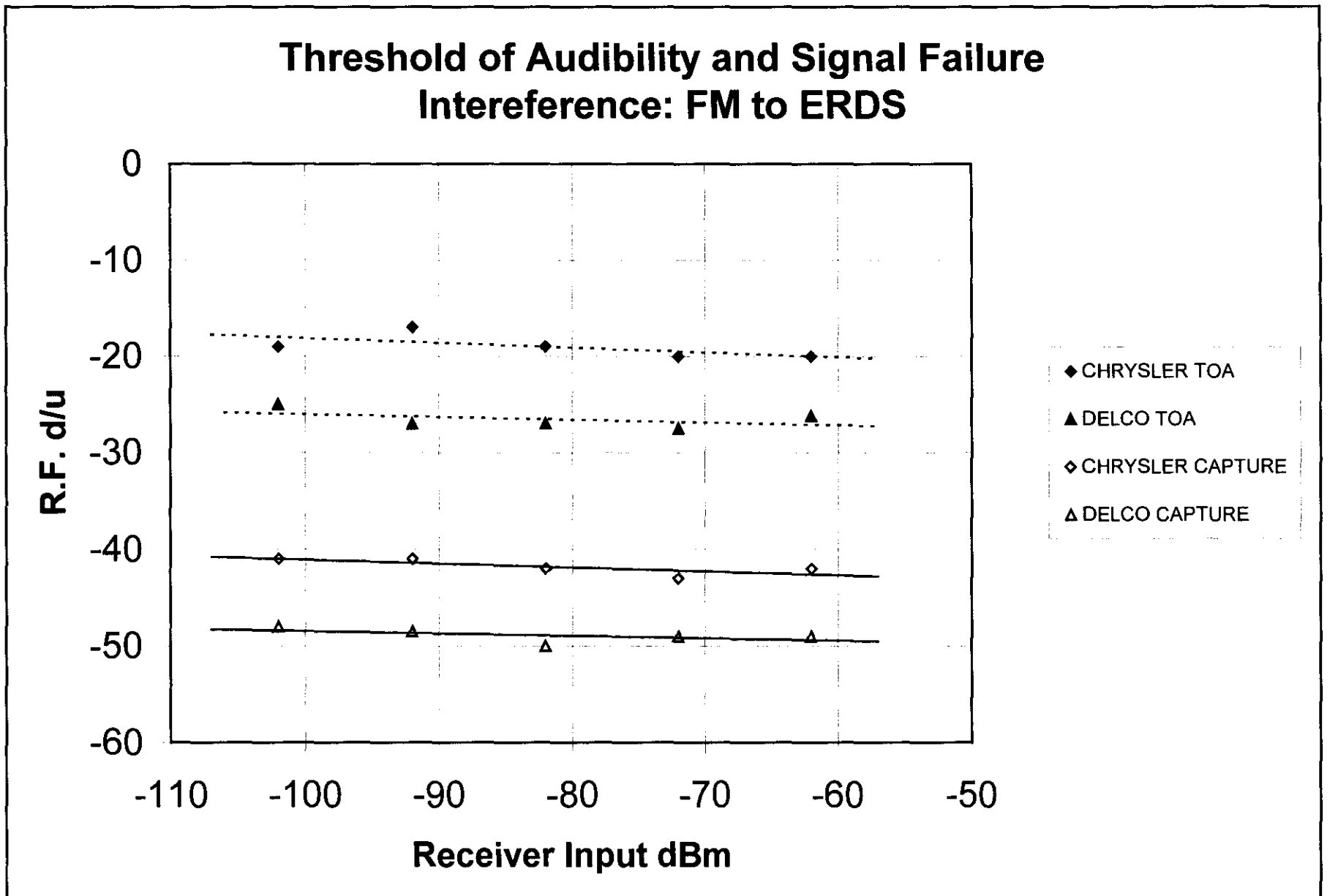

Threshold of Audibility and Signal Failure
Intereference: FM to ERDS
R.F. d/u
0
-10
-20
-30
-40
-50
-60
-110
-100
-90
-80
-70
-60
-50
Receiver Input dBm
CHRYSLER TOA
DELCO TOA
CHRYSLER CAPTURE
DELCO CAPTURE

FIGURE 1A

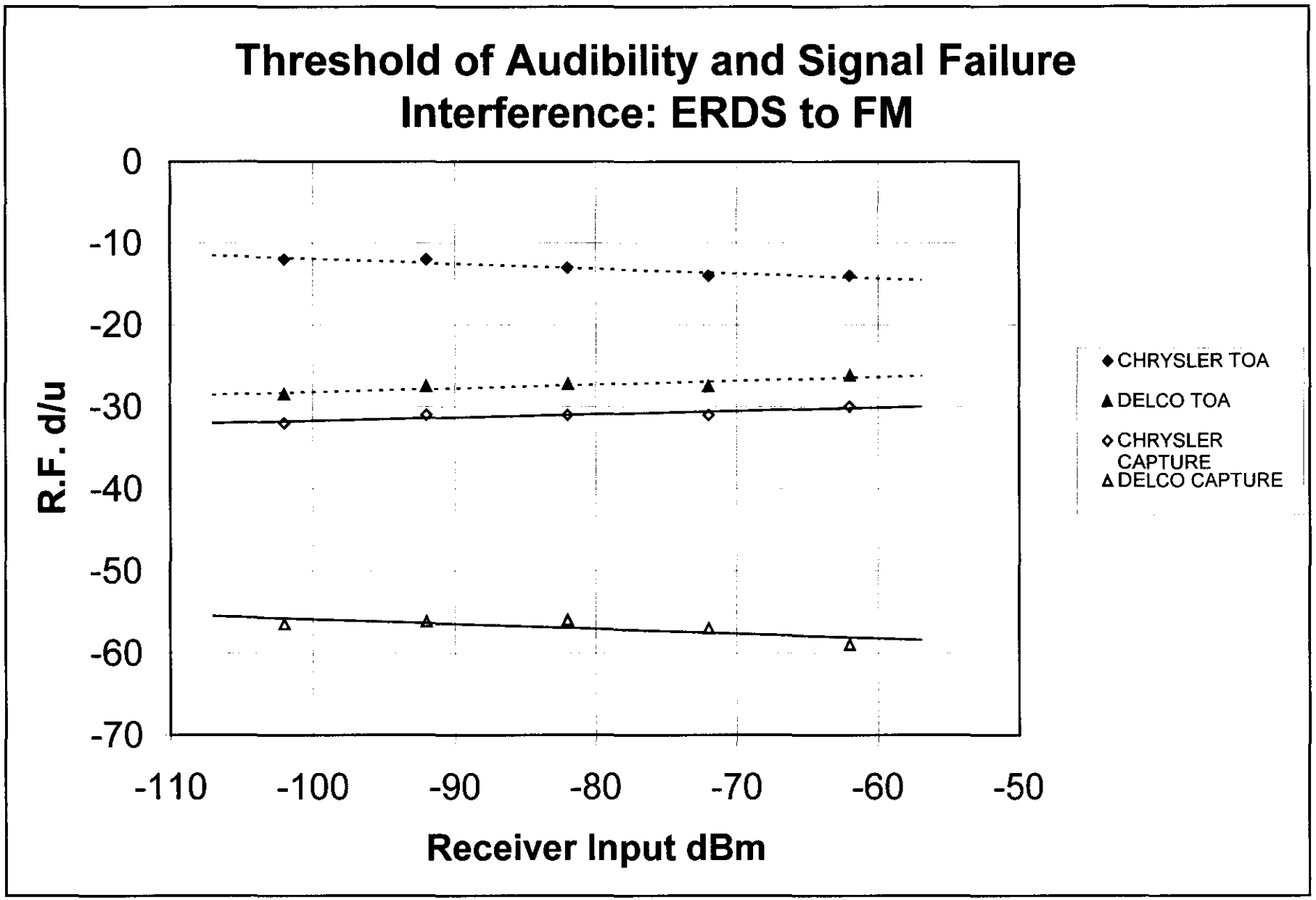

Threshold of Audibility and Signal Failure
Interference: ERDS to FM
R.F. d/u
0
-10
-20
-30
-40
-50
-60
-70
-110
-100
-90
-80
-70
-60
-50
Receiver Input dBm
CHRYSLER TOA
DELCO TOA
CHRYSLER CAPTURE
DELCO CAPTURE

FIGURE 1B

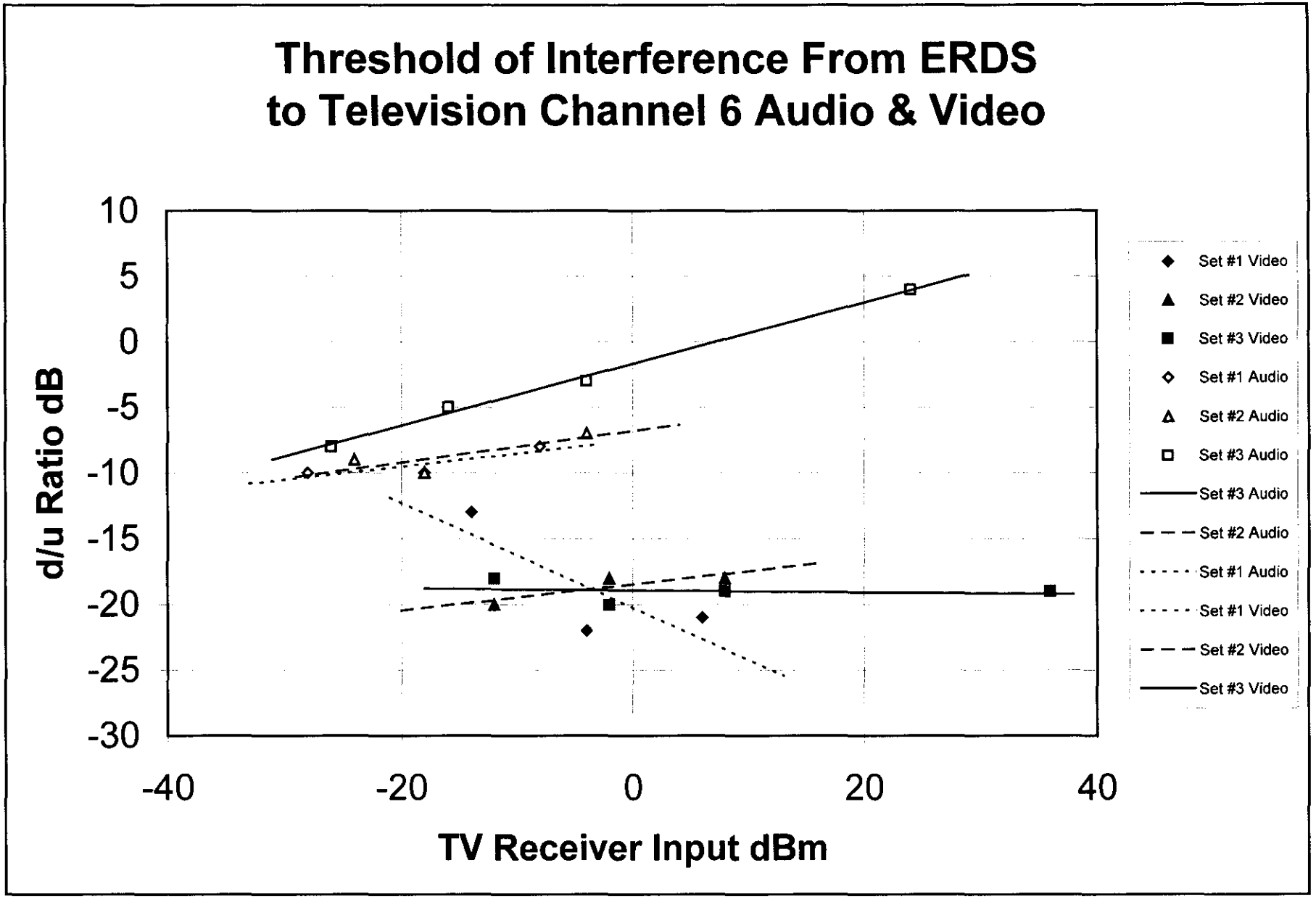

Threshold of Interference From ERDS
to Television Channel 6 Audio & Video
d/u Ratio dB
10
5
0
-5
-10
-15
-20
-25
-30
-40
-20
0
20
40
TV Receiver Input dBm
Set #1 Video
Set #2 Video
Set #3 Video
Set #1 Audio
Set #2 Audio
Set #3 Audio
Set #3 Audio
Set #2 Audio
Set #1 Audio
Set #1 Video
Set #2 Video
Set #3 Video

FIGURE 2